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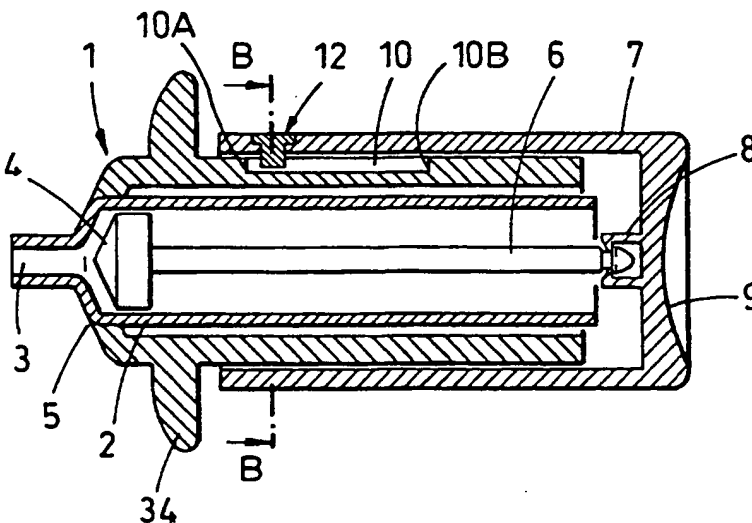
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(54) Title: DOSING SYRINGE

(57) Abstract

A syringe for administering liquids comprising a barrel which defines or comprises a cylinder, the cylinder having a nozzle at one end and including a piston within the cylinder, the piston being operatively coupled to a slide which is arranged to move in parallel with the piston, the longitudinal distance the piston can slide within the cylinder being defined by the selectable limits of travel of a stop surface on the barrel or the slide relative to end-stops on respectively the slide or barrel, the positions of the stop surface and end-stops being lockable relative to each other to define the selected limits of travel.



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DOSING SYRINGE

This invention relates to a novel device, being a syringe for dispensing liquids, in particular liquid pharmaceutical formulations.

5 It is often necessary to administer liquid pharmaceutical formulations in accurate volumes, so as to strike a balance between administration of insufficient of the formulation to achieve the desired therapeutic effect, and administration of too much of the formulation so that undesirable side effects occur.

Liquid pharmaceutical formulations are often administered by means of a
10 syringe capable of administering a set volume of the liquid. Such syringes may have a nozzle which can be fitted with a hypodermic needle for transdermal administration, or may be used for oral administration of the formulation to small children, babies etc who may have difficulty in swallowing a solid formulation form such as a tablet.

Such syringes include a cylinder and a piston slideably moveable within the
15 cylinder, the volume of the cylinder and the distance the piston can move along the cylinder defining the volume which is administered by the syringe. Some such syringes are adjustable so that they can be adjusted to administer a preselected set volume, which can be selected in accordance with for example the seriousness of the disease to be treated and/or the age or weight of a child to which the formulation is to
20 be administered.

Various constructions of such syringes are known, for example in EP 0154593, EP 0268191, EP 0293572, EP 0327910, EP 0338806, EP 0368191, EP 0373321, US 4112945, EP 0106578 and FR 711644.

Generally such syringes suffer from excessive mechanical complexity, which
25 leads to expense, the increased possibility of mechanical malfunction, and problems of patient compliance or confusion over the correct way to use the syringe. Moreover these syringes suffer from the problem of ensuring that once the syringe is set to administer a set dose, the syringe is not adjusted to administer an incorrect dose.

It is an object of this invention to provide an improved adjustable syringe that
30 to some extent at least alleviates these problems. In particular it is an object of this invention to provide an adjustable syringe that can be easily set to a required dose, but thereafter is relatively difficult to adjust, so that once set, for example by a pharmacist, it is relatively difficult for a patient to vary the dose set, so that mis-use of the syringe is reduced. Other objects of this invention will be apparent from the
35 following description.

According to this invention a syringe suitable for administering liquids comprises a barrel which defines or comprises a cylinder, the cylinder having a nozzle at one end and including a piston which is longitudinally slideable within the cylinder, the distance the piston can move within the cylinder defining the volume

which is administered by the syringe, the piston being operatively coupled to a slide which is arranged to move in parallel with the piston, the longitudinal distance the piston can slide within the cylinder being defined by the limits of travel of a stop surface on the barrel or the slide relative to end-stops on respectively the slide or
5 barrel, the syringe being lockable into a state in which the stop surface and end stops can only move relative to each other within limits of travel selected from two or more selectable predetermined limits of travel.

The term "lockable" as used herein means that the limit of travel is easily selectable but once selected is locked such that the limit of travel cannot be changed,
10 or is only changeable with considerable difficulty, or with damage to the syringe, or with leaving an indication by damage of the attempt to vary the limit of travel.

The cylinder may be defined by a cylindrical bore within the barrel, in which case the barrel and cylinder may be integral. Alternatively the barrel may be in the form of a sleeve wholly or partly surrounding the cylinder. In this latter case the
15 barrel and cylinder may be separately made, and fastened together, enabling the barrel and cylinder to be made of different materials.

The barrel and slide are suitably in the form of sleeves surrounding each other and longitudinally slideable relative to each other. Either the slide may surround the barrel or the barrel may surround the slide, and in the latter option the slide may
20 surround the cylinder in the form of a surrounding sleeve. The slide, barrel and/or cylinder may have cooperating guides, such as interlocking shaped parts etc to encourage linear relative longitudinal sliding, in a generally known manner, and/or may be of a cross section that encourages linear longitudinal relative sliding and restricts unintended relative rotation or lateral movement. Suitably the slide and
25 barrel may be in the form of a sleeves wholly or partly enclosing each other and closely conforming to the cross section of each other and longitudinally slideable relative thereto in a telescoping manner and enclosing the cylinder.

The operative coupling between the piston and the slide may comprise a rigid linking, which may be releasable, for example by snap-fit cooperating elements on
30 the piston and slide, or alternatively the piston and slide may be integral. The piston may include conventional features such as sealing rings etc.

In one embodiment of the invention the preselectable limits of travel may be selected by a construction of the syringe in which the stop surface and/or end stops may be relatively moveable into and lockable in two or more selected positions
35 relative to each other.

The preselectable limits of travel may suitably be defined by the limits of travel of a stop surface on the barrel or slide between end-stops defined as the ends of a generally longitudinal slot on respectively the slide or the barrel.

The syringe may include two or more such slots being of different lengths

corresponding to the two or more preselectable limits of travel. Alternatively the slot may be defined by a gate having a ramped or stepped shape, each part of the ramp or each step defining a different slot length. Alternatively the slot may be in the form of a gate within which the longitudinal position of the stop surface relative to the ends of the slot may be selected.

Alternatively the preselectable distances may be defined by the limits of travel of a stop surface on the barrel or slide between end stops defined by the positions of one or more projecting abutments on respectively the slide or the barrel.

The syringe may include pairs of stop surfaces and end-stops defining parallel travel distances of the same length to encourage smooth relative sliding.

In a first embodiment, the stop surface may comprise a pin insertable in a hole in the barrel or slide so as to project therefrom, the projecting part forming a stop surface, the location of each such hole relative to the end-stops defining one of the preselected travel distances.

Such a pin may comprise a key which is capable of fitting into only one of two or more positions, e.g holes, in the barrel or slide, to prevent inadvertent insertion into the wrong position which might result in administration of an incorrect volume from the syringe. Such a key may also be so shaped that once fitted into position it cannot be removed, or only with difficulty or the use of a special tool, so as to prevent removal and reinsertion into the incorrect position. This may be achieved for example by a key which is a tight snap fit within a corresponding receptacle or hole on the syringe, or by a key which fits substantially flush with the surface of the syringe to make removal difficult.

Such a key may also be arranged to co-operate with a fail-safe mechanism which only permits the syringe to work when such a pin is in place. For example the insertion of the pin into the hole may disengage a locking mechanism which prevents the slide from sliding relative to the barrel.

In one form of the syringe which uses such a pin, the slide may be in the form of a sleeve wholly or partly enclosing the barrel, the sleeve having two or more holes passing completely through its wall, each hole being adjacent to a slot or a gate formed in or through the surface of the barrel, each hole defining a selectable position of the pin relative to the ends of the slot or gate, so as to define different limits of travel.

By insertion of the pin through one of the holes so that it projects beyond the surface of the sleeve on its inside and forms a projection, the distance the barrel and sleeve can slide relative to each other is defined by the travel of the projection acting as a stop surface within the corresponding slot or the gate, the longitudinal ends of which act as end stops. In one version of this embodiment the pin is in the form of a key which will only fit one of the holes.

In another form of the syringe which uses such a pin, the slide may be in the form of a sleeve wholly or partly enclosing the barrel, the sleeve having two or more slots, each slot being of a different length, or a gate, passing completely through its wall, the corresponding area of the surface of the barrel having one or more holes therein, each hole being adjacent to a slot or to the gate each hole defining a selectable position of the pin relative to the ends of the slot or gate, so as to define different limits of travel.

By insertion of a pin through a slot or the gate into one of the holes such that it projects, to form a stop surface, from the surface of the barrel into the slot or gate, the longitudinal ends of which act as end stops, the limit of travel of the sleeve and barrel relative to each other is defined by the travel of the projection within the corresponding slot or the gate. Each hole thereby defines a selectable position of the pin relative to the ends of the slot or gate, so as to define different limits of travel. In one version of this embodiment the pin is in the form of a key which will only fit one of the holes.

In a second embodiment, the slot(s) or gate may be moveable relative to a fixed stop surface on the barrel or slide. For example the slide may be in the form of a sleeve which is rotatable relative to the barrel, as well as being longitudinally slideable relative to the barrel, and relative rotation of the sleeve or the barrel may alter the relative positions of the stop surface and the end stops so as to define different limits of travel of the stop surface within the slot(s) or gate.

For example the slide may be in the form of a sleeve rotatable upon a cylindrical barrel or part of the barrel, the sleeve having a stepped gate passing completely through its wall, there being a projection on the surface of the barrel from the area of the barrel adjacent to the gate, and relative rotation of the sleeve on the barrel brings the projection into position in line with parts of the gate having different lengths, so as to define different limits of travel.

The sleeve may be locked in any one of these positions by appropriate means, for example by means of a locking insert, e.g a pin, insertable into a hole passing through the wall of the sleeve into a corresponding hole in the barrel. The locking pin may, as above, be in the form of a key insertable into any one locking position so as to prevent incorrect administration.

Similarly the locking pin may cooperate with a fail-safe mechanism as described above.

In a third embodiment the gate or slot(s) and stop surface may be moveable relative to each other, and the stop surface may be snap-fitted into position within the slot or gate against the resilience of the syringe material in the region of the slot or gate, the stop surface and/or the region having ramped surfaces such that when snap fitted into the slot or gate the stop surface is locked within a selected slot or part of

the gate so as to define a limit of travel.

In this embodiment the stop surface may suitably be a projection from the barrel or slide, having a wedge faced profile which enables the projection to move across the surface of the slide or barrel respectively as the syringe is assembled and to lockably snap into position in the selected slot or part of the gate, and having an abutment face opposite the wedge face to prevent the stop surface from thereafter being removed.

The syringe of the invention may be easily pre-set by a pharmacist or by the user to deliver only a preselected prescribed dose of a liquid pharmaceutical formulation.

Suitably the entire assembly of barrel, cylinder, piston and slide may be made of conventional plastics materials, or the cylinder may be made separately of other conventional inert materials such as glass. The relatively simple construction of the syringe of the invention, and the avoidance of complex mechanisms enables the syringe to be moulded in "friendly" shapes, avoiding the more "clinical" appearance of known syringes, making them particularly suitable for use with small children.

The invention will now be described by non-limiting examples, with reference to the following figures which show:

Figs. 1 to 4. A syringe of the invention in section and disassembled views, and keys for the syringe.

Figs. 5 to 7. A syringe of the invention in section and disassembled views, and keys for the syringe.

Figs. 8 to 11 Syringes of the invention in section and assembled views.

Figs. 12 to 14 Syringes of the invention in section and assembled views.

Figs. 15 to 17 Syringes of the invention in section and assembled views.

Figs. 18 and 19 Syringes of the invention in section and assembled view.

In Fig. 1 a syringe of the invention is shown in longitudinal section. In Fig. 2 the syringe of Fig. 1 is shown in cross section about the line B---B of Fig. 1. In Fig. 4, the syringe of Fig. 1 is shown in a semi-dismantled view. The syringe comprises a barrel (1) in the form of a sleeve which surrounds a cylinder (2) having a nozzle (3) at one end. Within the cylinder (2) there is a piston (4) which is longitudinally slideable within the cylinder (2). The cylinder (2) is retained within the barrel (1) by a snap fit connection at (5). The nozzle (3) may for example be shaped to receive a hypodermic needle, be so shaped as to receive a teat (for small babies to suck) or be a simple nozzle, as shown, to allow a volume to be dispensed.

The piston (4) is operatively coupled by a rigid link rod (6) to a slide (7) in the form of a sleeve which surrounds and is longitudinally slideable on the barrel (1). The link rod (6) fits into a snap-fit male-female socket (8) in the end wall (9) of slide (7). As shown in Fig 2, the cross section of the sleeve (7) corresponds closely to that

of the barrel (2), both being of a substantially rectangular cross section to inhibit relative rotation. The relative clearances of the parts shown in Figs. 1 to 6 are exaggerated for clarity.

5 In the outer surface of barrel (1) are a number of slots (10), of differing length. Passing completely through the wall of the slide (7) are holes (11), corresponding in number to the number of slots (10), and located such that when the sleeve (7) is in place on the barrel (1) each hole (11) is adjacent to a slot (10).

10 In Figs. 1 and 2 a pin (12) is shown inserted completely through a hole (11) so as to extend internally beyond the inner wall of slide (7) to form a projection into the interior of the slide, into the slot (10). The distance over which the slide (7) can slide relative to the barrel (1) is consequently defined by the limits of travel of the inwardly projecting part of pin (12) acting as a stop surface between the ends (10A, 10B) of slot (10) acting as end stops. It will be apparent that insertion of the pin (12) into each of the holes (11) will result in a different limit of travel of the pin (12) in a slot (10).

15 With reference to Fig. 3 a pin (12) in the form of a key is shown in more detail. The pin (12) is in the form of a strip (12A) of plastics material conforming in shape to the section of the slide (7). This strip (12A) is shaped to fit flush into a recess (13) in the outer surface of slide (7) and to be retained therein by a snap-fit or friction fit action, thereby making it easy to insert but difficult to remove. From the underside of the strip (12A) projects a pin (12B). The position of the pin (12B) is such that it will only project through one of the holes (11) in the slide (7). The possible positions of pins (12B) on alternative strips (12A) which could be inserted through other holes (11) is shown by dotted lines in Fig. 2.

25 In Fig. 4 the syringe of Figs 1 and 2 is shown in a partly dissembled view showing the relationship of the barrel (1) and slide (7) before assembly.

In Figs. 5 and 6, alternate arrangements of the barrel (1) are shown. In Fig. 5 a barrel (1) has a stepped gate (14) formed in its surface. The distance between the end (14A) and each step (14B, 14C, 14D) acting as end stops defines the limits of travel of stop surface in the form of a pin (12) when the slide (7) as shown in Fig 3 is in place on barrel (1).

30 In Fig 6 a barrel (1) is shown in which slots (10) are formed in a manner similar to that of Fig. 1. In the barrel of Fig. 6 two sets of slots (10) are provided, so that pairs of slots (10) of the same length are present in the surface of the barrel (1). A pin in the form of a key (not shown) similar to (12A) of Fig 3 is again provided which can project through holes (11) passing through the wall of slide (7) in the same manner as the pin (12A) of Fig. 1, but having two pins (12B) each capable of projecting through a different hole (11) corresponding to a pair of slots (10).

Fig. 7 shows how three keys (12C) may be moulded integrally linked at

thinned points (12D) at which they can be broken apart and separated. The integral keys (12C) may be provided together with a syringe, for example fitting into a corresponding shaped receiving cavity in the syringe body.

Referring to Figs. 8 to 11, an alternative arrangement of syringe is shown in longitudinal section in Fig. 8, in a cross section in Fig. 9 about the line B.....B of Fig 8, and in an assembled view in Figs 10 and 11. The syringe comprises a cylinder (2), piston (4) and link rod (6) snap-fitted within a barrel (1) in a similar arrangement to that shown in Fig. 1. The syringe of Fig. 8 has a barrel (1) and sleeve-form slide (7) similar in shape to that of Fig. 1. Again the clearance between the parts shown in Fig. 8 to 11 is exaggerated for clarity.

In the syringe of Figs 8 to 11, the barrel (1) is provided with a number of socket holes (15) each capable of receiving an insertable pin (16) and retaining the pin by a snap-fit action. The syringe is provided with a number of pins (16) each of a cross section, eg circular, square or triangular which allows it to be inserted only in a selected hole (15) of corresponding shape, as shown in Figs 10 and 11. The pin (16) projects from the surface of the barrel (1) to form a projection which acts as a stop surface.

As shown in Fig. 8, the cross section of the barrel (1) and the slide sleeve (7) are substantially rectangular, so as to minimise relative axial rotation.

In the slide (7) is formed either a number of slots of different lengths (17) as shown in Fig 10 or a stepped gate (18) as shown in Fig 11, both in the form of an aperture passing completely through the wall of the slide (7). With the pin (16) in place in a socket (15) and the slide (7) in place on the barrel (17), the distance that the slide can slide relative to the barrel (1) is defined by the limit of travel of the pin (16) between the ends (17A, 17B), (18A, 18B) of the slot (17) or gate (18) acting as end stops. The socket holes (15) and pin (16) are distinctively co-operatively shaped so that the pin (16) can only be inserted in the socket for which it is intended.

Referring to Figs. 12 to 14, a further alternative arrangement of syringe is shown in longitudinal section in Fig. 12, in a cross sectional part view about the line B----B in Fig. 13, and assembled in Fig. 14. The clearance between the parts shown in Figs. 12 to 14 is exaggerated for clarity.

The syringe comprises a cylinder (19). Within the cylinder (19) is a piston (4) which is integrally formed with a link rod (6) and slide (7). The cylinder (19) is surrounded by a barrel (20) in the manner of a sleeve, and the slide (7) is itself partly surrounded by the barrel (20) in the manner of a slideable sleeve surrounding the cylinder (19) and itself surrounded by the barrel (20). In the region of surround the slide (7), cylinder (19) and barrel (20) are of a cylindrical shape so that the slide (7) may be rotated axially on the cylinder (19) in addition to being longitudinally slideable thereon. The barrel (20) is fitted onto the cylinder (19) by a friction fit, or

screw or snap fit connection at (21). On the outer wall of the slide (7) is an integral projection (22). In the barrel (20) is a stepped gate (23) extending completely through the wall of the barrel (20). The projection (22) projects into the gate (23) so that the distance the slide (7) can slide relative to the barrel (20) is defined by the travel of the projection (22) acting as a stop surface between the ends (23A, 23B, 23C, 23D) of the gate (23) acting as end stops.

The slide (7) and barrel (20) may be relatively rotated so that the projection (22) is adjacent to a selected one of the ends (23B, 23C, 23D) of the steps of the gate (23). In the wall of barrel (20) is a hole (24), through which may be inserted a locking pin (25), which cooperates with one of a number of guide grooves (26) formed in the wall of the slide (7), so that the slide (7) is locked into a position adjacent to one of the stepped ends (23B, 23C, 23D).

Referring to Figs. 15 to 17, a modification of the syringe of Figs. 12 to 14 is shown, in longitudinal section in Fig. 15, in a cross section about the line B--B in Fig. 16, and assembled in Fig. 17. The clearance between the parts shown in Fig. 15 to 17 is exaggerated for clarity.

The arrangement of the syringe of Fig. 15 to 17 is similar to that of Fig. 12 to 14, having a cylinder (19) and barrel (20), a slide and integral piston and link rod (7), (4), (6), the barrel (20), fitting to the cylinder (19) by a snap fit, friction fit or screw fit at (21).

In the barrel (20) are a number of slots (27) of different lengths. On the slide (7) is an integral projection (28), which is of a wedge shape. The syringe may be assembled by relatively rotating the unassembled slide (7) and barrel (20) such that the projection (28) is aligned with a selected one of the slots (27), then inserting the slide (7) into the barrel (20) in the longitudinal direction shown by the arrow so that the wedge face (28A) of the projection (28) snaps under the region (20A) of the barrel (20) adjacent to a selected one of the slots (27), and then into the space within the slot (27). The opposite abutment face (28B) of the projection (28) then prevents its removal from the slot (27). The distance the slide (7) and barrel (20) can slide relative to each other is then defined by the travel of the projection (28) acting as a stop surface between the ends (27A, 27B), acting as end stops, of the slot in which it lies.

Referring to Figs 18 and 19, a syringe is shown in an assembled view in Fig 18, and in a longitudinal section perpendicular to the plane of Fig 18 in Fig 19. The syringe comprises a barrel (29), with an integral cylinder defined by the cylindrical bore (30) within the barrel (29). Within cylinder (30) is a piston (4) integrally linked to a slide (7) in the form of a sleeve surrounding the barrel (29) and longitudinally slideable thereon.

In slide (7) is a longitudinal slot (31) passing completely through the wall of

the slide (7). In the wall of barrel (29) are holes (32) into which can be fitted pins (33). Each of the holes (32) is at a different longitudinal distance along the slot (31) corresponding to the administration of a preselected volume of liquid from the syringe. Each of the holes (32) is shaped so as to receive, in a tight snap fit fitting, a
5 corresponding pin (33) which once fitted cannot be easily removed. The limit of longitudinal travel of the pin (33) acting as a stop surface between the end stops defined by the ends of the slot (31) defines the volume of liquid dispensed. By selection and fitting of an appropriate pin (33) the volume administered can be selected. In Figs 18 and 19 the clearance between the slide parts is exaggerated for
10 clarity.

The operation of the syringes of Figs. 1 to 19 is similar. With the piston (4) at the end of the cylinder (2), (19), (30) adjacent to the nozzle (3), the nozzle (3) is inserted in a liquid (not shown) and the piston is then drawn back by pulling the slide (7) to such liquid into the cylinder (2), (19), (30). The volume of liquid which can be
15 drawn into the cylinder (2), (19), (30) is defined by the limits of travel of the projection (12), (16), (22), (23), (33) within the slot (10), (17), (27), (32) or gate (18), (23). The liquid may then be ejected from the syringe via the nozzle (3) in a conventional manner. Conveniently the slide (7) may be moved towards the nozzle (3) by the user's thumb pressure whilst the user's fingers grip the finger grips (34).

20 Each of the syringes of Figs 1 to 16 may be further provided with a holder for a pin (12), (16), (25) supplied with the syringe. Conveniently a pin (16), (25), (33) may be supplied as a nose pin which also fits the nozzle (3).

Claims:

1. A syringe suitable for administering liquids comprising a barrel which defines or comprises a cylinder, the cylinder having a nozzle at one end and including a piston which is longitudinally slideable within the cylinder. the distance the piston can move within the cylinder defining the volume which is administered by the syringe, the piston being operatively coupled to a slide which is arranged to move in parallel with the piston, the longitudinal distance the piston can slide within the cylinder being defined by the limits of travel of a stop surface on the barrel or the slide relative to end-stops on respectively the slide or barrel, the syringe being lockable into a state in which the stop surface and end stops can only move relative to each other within limits of travel selected from two or more selectable predetermined limits of travel.
2. A syringe according to claim 1 characterised in that the barrel and slide are in the form of sleeves surrounding each other and longitudinally slideable relative to each other.
3. A syringe according to claim 1 or 2 characterised in that the preselectable limits of travel are selected by a construction of the syringe in which the stop surface and/or end stops are relatively moveable into and lockable in two or more selected positions relative to each other.
4. A syringe according to claim 1, 2 or 3 characterised in that the preselectable limits of travel are defined by the limits of travel of a stop surface on the barrel or slide between end-stops defined as the ends of a generally longitudinal slot on respectively the slide or the barrel.
5. A syringe according to claim 4 characterised in that the syringe includes two or more such slots being of different lengths corresponding to the two or more preselectable limits of travel, or the slot is defined by a gate having a ramped or stepped shape, each part of the ramp or each step defining a different slot length, or the slot is in the form of a gate within which the longitudinal position of the stop surface relative to the ends of the slot may be selected.
6. A syringe according to any one of claims 1 to 5 characterised in that the stop surface comprises a pin insertable in a hole in the barrel or slide so as to project therefrom, the projecting part forming a stop surface, the location of each such hole relative to the end-stops defining one of the preselected travel distances.

7. A syringe according to claim 7 characterised in that the pin comprises a key which is capable of fitting into only one of two or more positions in the barrel or slide.
- 5
8. A syringe according to claim 6 or 7 characterised in that the slide is in the form of a sleeve wholly or partly enclosing the barrel, the sleeve having two or more holes passing completely through its wall, each hole being adjacent to a slot or a gate formed in or through the surface of the barrel, each hole defining a selectable position of the pin relative to the ends of the slot or gate, so as to define different limits of travel.
- 10
9. A syringe according to claim 6 or 7 characterised in that the slide is in the form of a sleeve wholly or partly enclosing the barrel, the sleeve having two or more slots, each slot being of a different length, or a gate, passing completely through its wall, the corresponding area of the surface of the barrel having one or more holes therein, each hole being adjacent to a slot or to the gate, each hole defining a selectable position of the pin relative to the ends of the slot or gate, so as to define different limits of travel.
- 15
- 20
10. A syringe according to any one of claims 1 to 5 characterised in that the slot(s) or gate are moveable relative to a fixed stop surface on the barrel or slide.
- 25
11. A syringe according to claim 10 characterised in that the slide is in the form of a sleeve which is rotatable relative to the barrel, as well as being longitudinally slideable relative to the barrel, and relative rotation of the sleeve or the barrel alters the relative positions of the stop surface and the end stops so as to define different limits of travel of the stop surface within the slot(s) or gate.
- 30
12. A syringe according to claim 11 characterised in that the slide is in the form of a sleeve rotatable upon a cylindrical barrel or part of the barrel, the sleeve having a stepped gate passing completely through its wall, there being a projection on the surface of the barrel from the area of the barrel adjacent to the gate, and relative rotation of the sleeve on the barrel brings the projection into position in line with parts of the gate having different lengths, so as to define different limits of travel.
- 35
13. A syringe according to claim 10, 11 or 12 characterised in that the sleeve is locked in position by means of a locking insert insertable into a hole passing through the wall of the sleeve into a corresponding hole in the barrel.

14. A syringe according to claim 13 characterised in that the locking pin is in the form of a key insertable into a locking position.
- 5 15. A syringe according to any one of claims 1 to 5 characterised in that the gate or slot(s) and stop surface are moveable relative to each other, and the stop surface may be snap-fitted into position within the slot or gate against the resilience of the syringe material in the region of the slot or gate, the stop surface and/or the region having ramped surfaces such that when snap fitted into the slot or gate the stop
- 10 surface is locked within a selected slot or part of the gate so as to define a limit of travel.
16. A syringe according to claim 16 characterised in that the stop surface is a projection from the barrel or slide, having a wedge faced profile which enables the
- 15 projection to move across the surface of the slide or barrel respectively as the syringe is assembled and to lockably snap into position in the selected slot or part of the gate, and having an abutment face opposite the wedge face to prevent the stop surface from thereafter being removed.
- 20 17. A syringe according to any one of the preceding claims, substantially as hereinbefore described with reference to the accompanying drawings.

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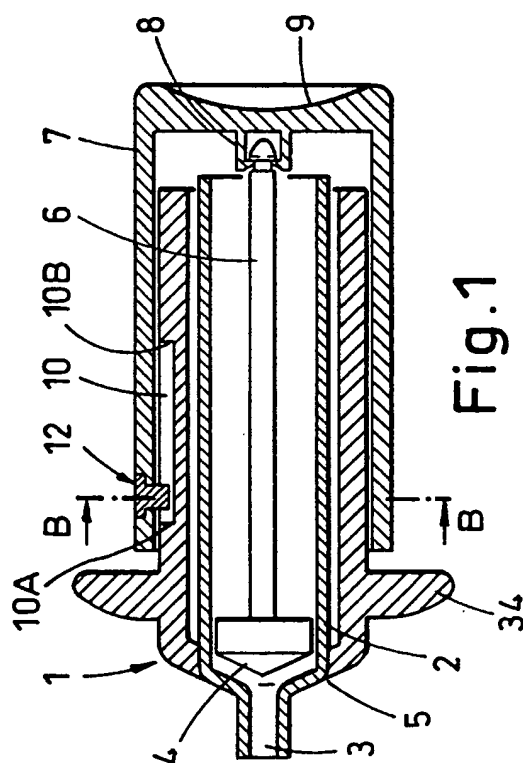


Fig. 1

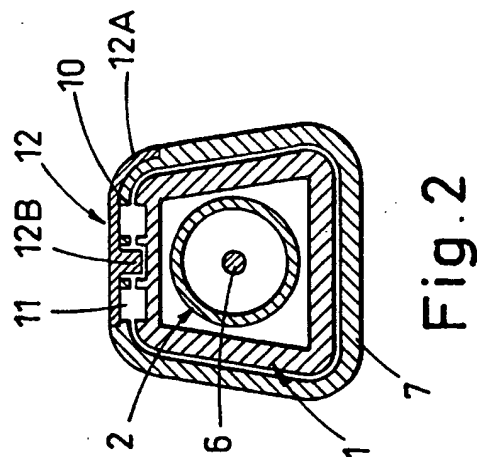


Fig. 2

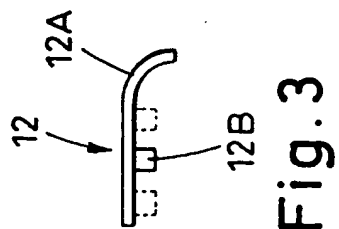


Fig. 3

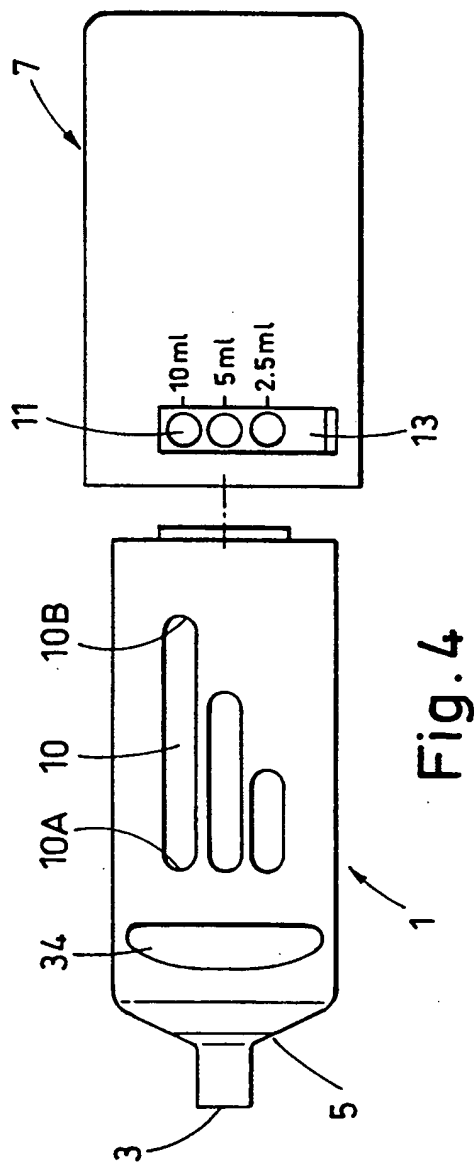


Fig. 4

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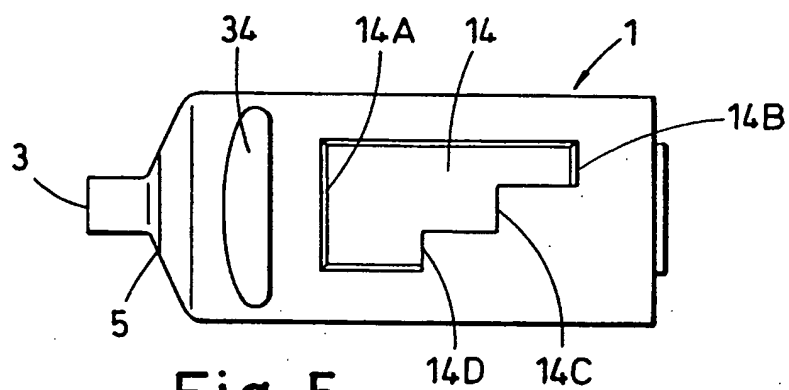


Fig. 5

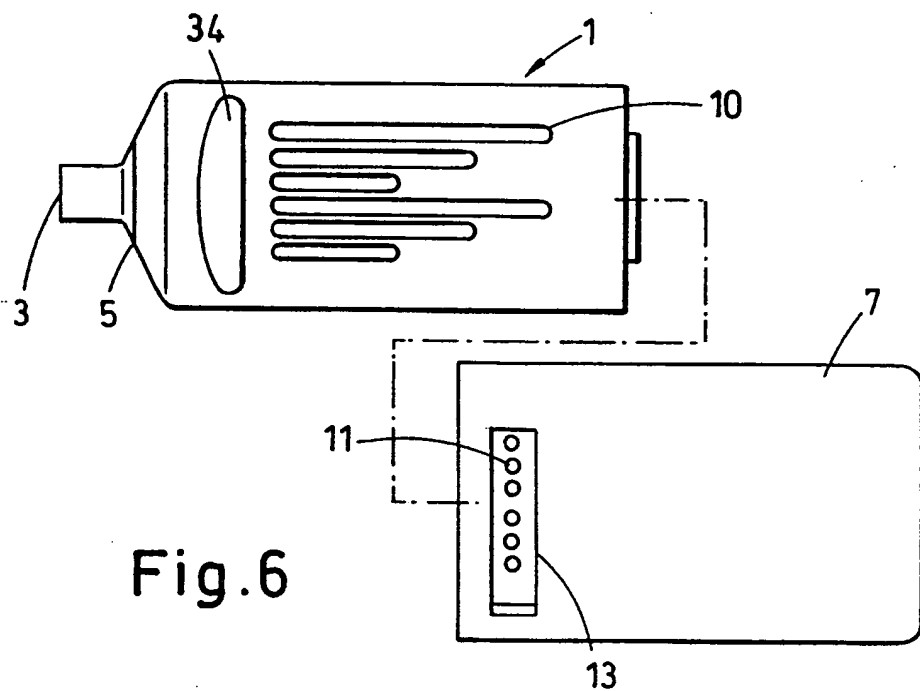


Fig. 6

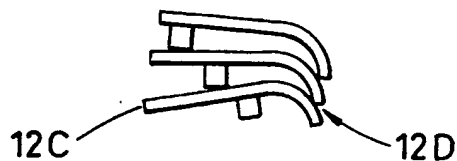
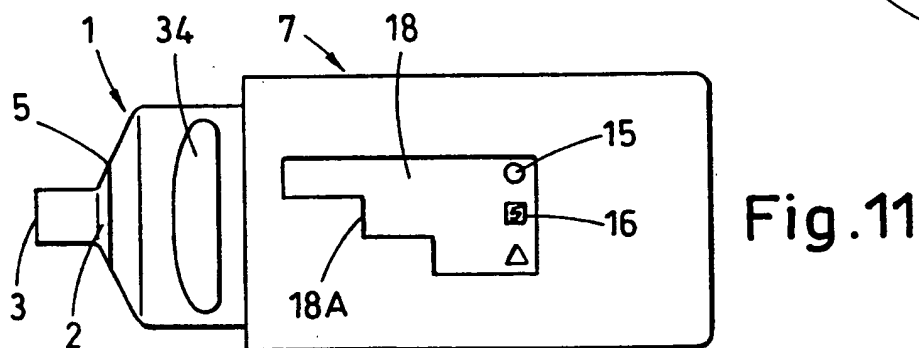
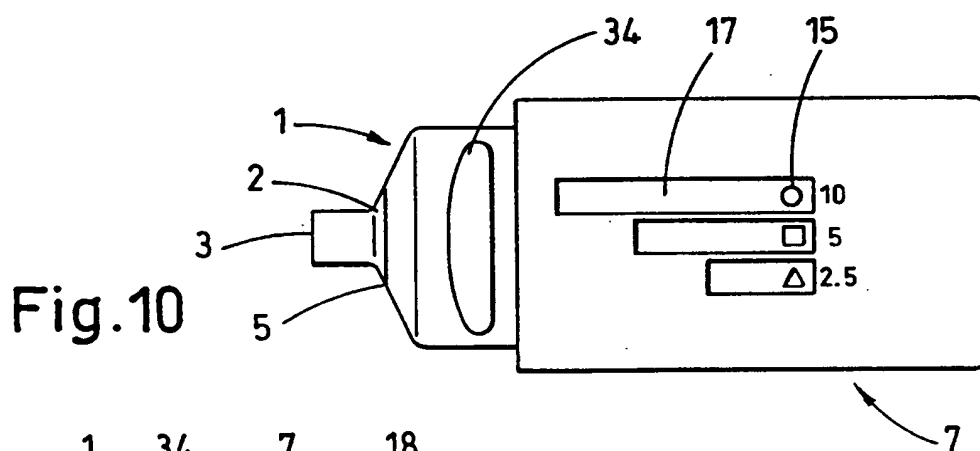
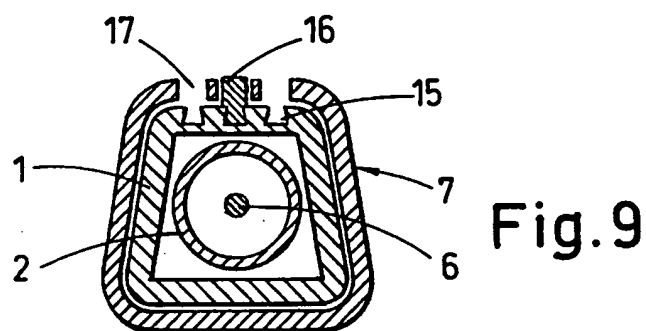
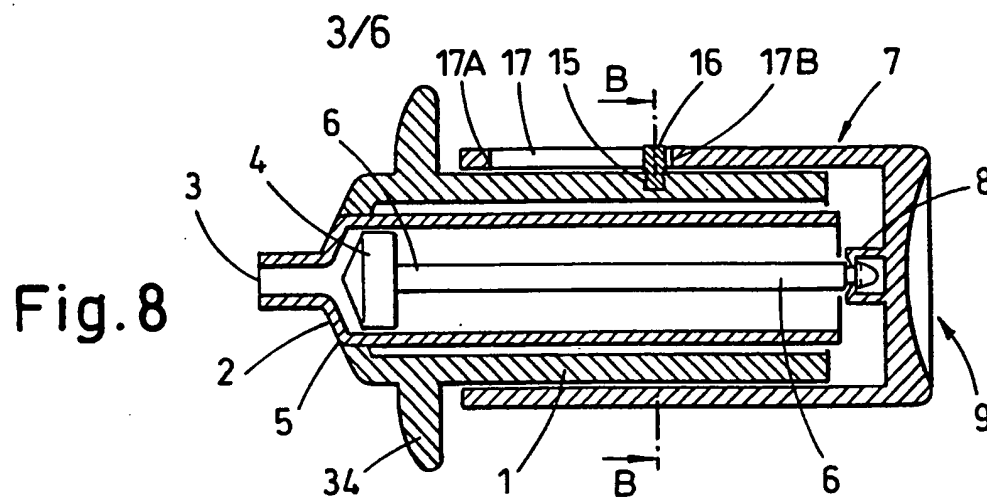
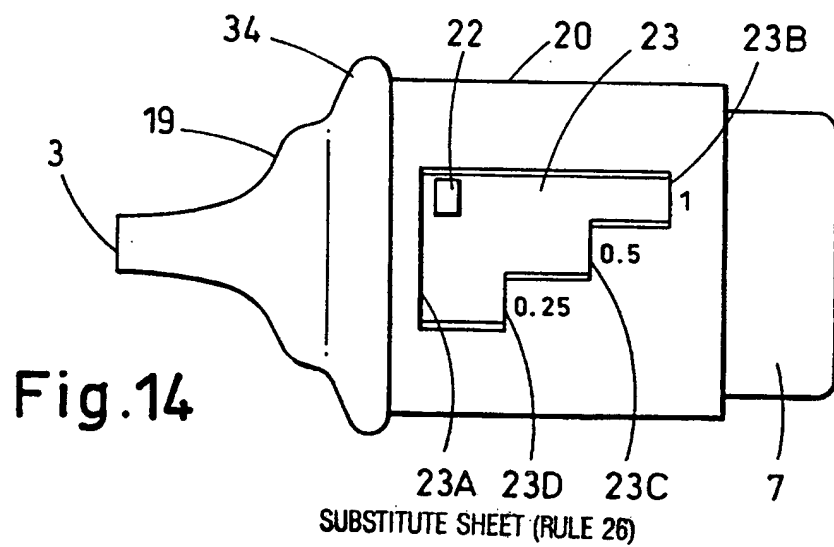
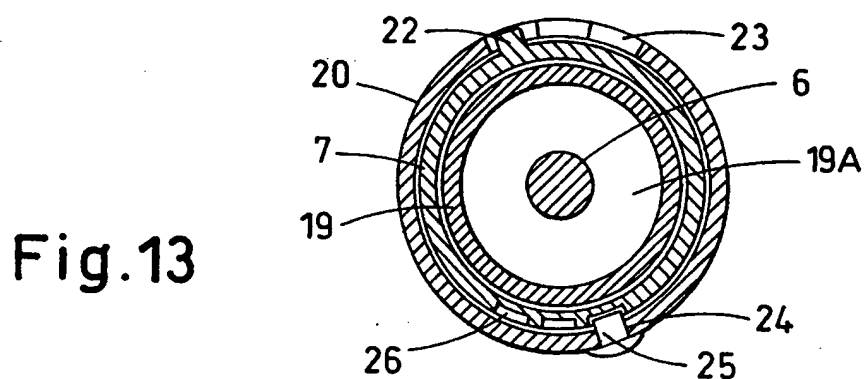
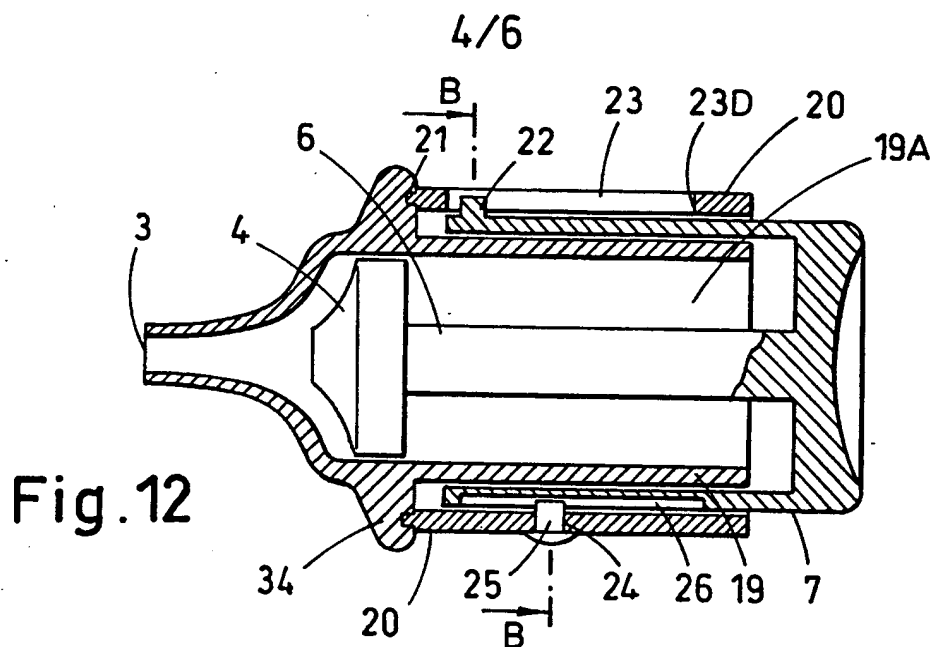
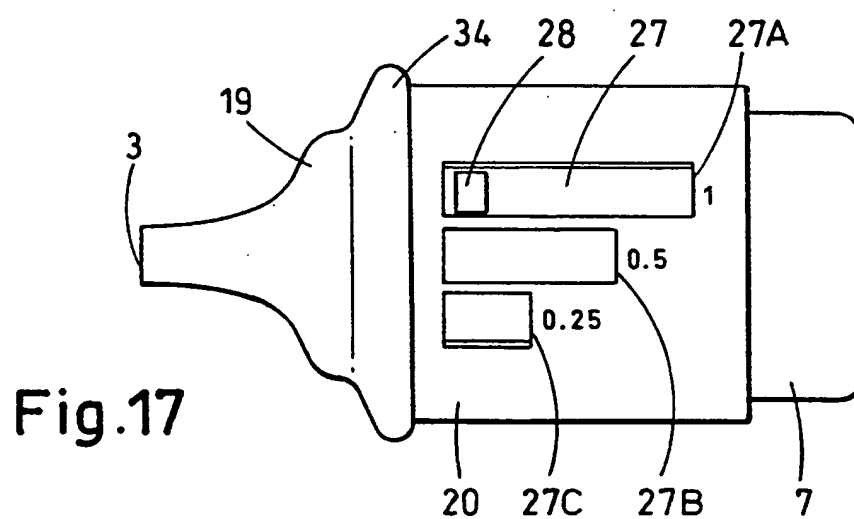
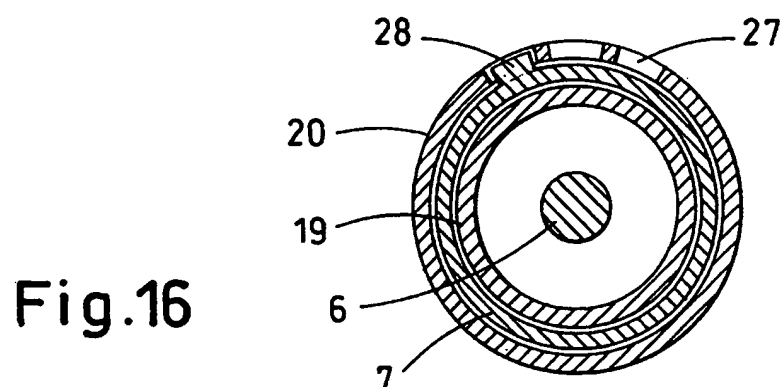
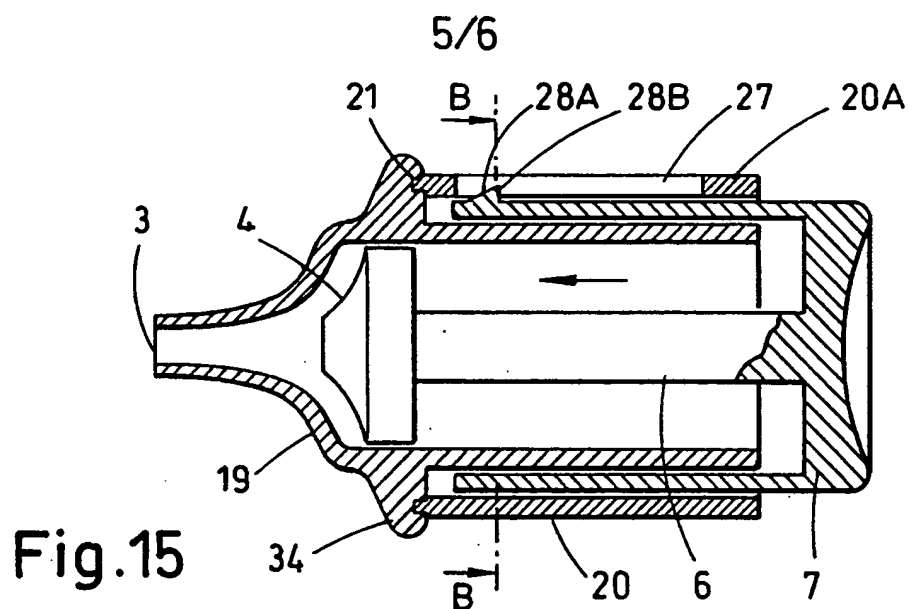


Fig. 7





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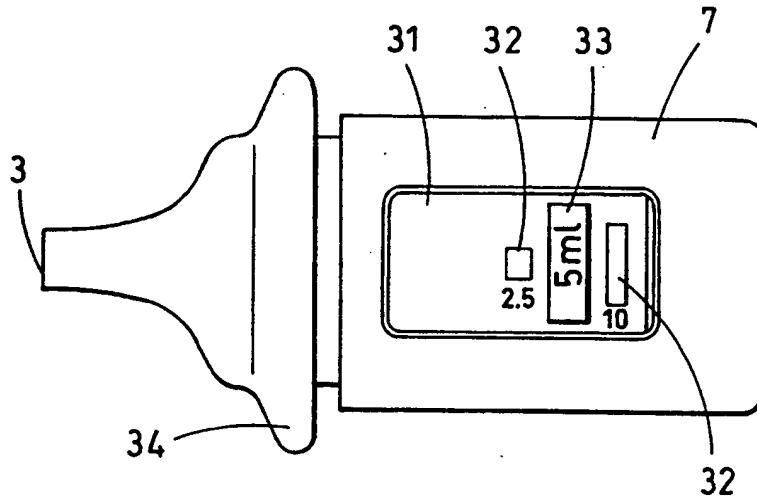


Fig. 18

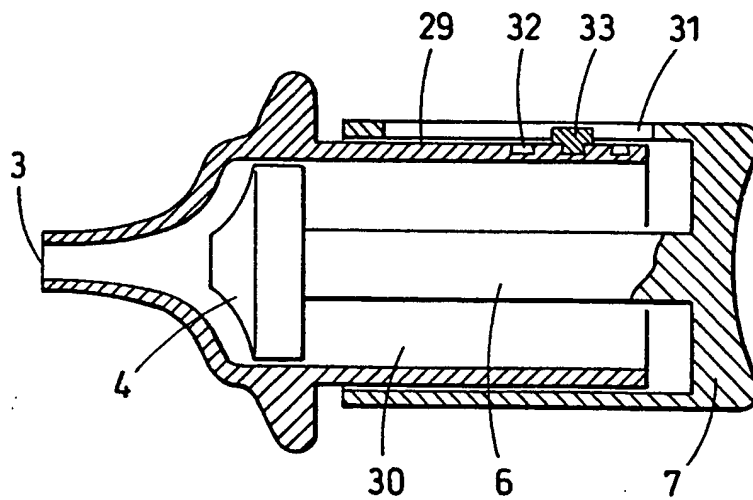


Fig. 19

INTERNATIONAL SEARCH REPORT

International application No.

PCT/EP 94/02554

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61M5/315

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO,A,91 13689 (ING. ERICH PFEIFFER GMBH & CO) 19 September 1991 see page 8, paragraph 2 -paragraph 3; figures ---	1-5,10, 11,17
X	US,A,4 112 945 (HELIXON ET AL) 12 September 1978 cited in the application	1-3
Y	see column 5, line 15 - line 64; figures 6-10 ---	4,5, 10-12
Y	FR,A,711 644 (COLLIN ET CIE) 14 September 1931 cited in the application see the whole document ---	4,5, 10-12
-/--		

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

27 October 1994

Date of mailing of the international search report

22.11.94

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Authorized officer

Clarkson, P

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 94/02554

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,A,41 34 911 (KATZ) 29 April 1993 see column 2, line 1 - line 24; figures 1-4	1-17
A	FR,A,2 625 981 (VALOIS) 21 July 1989 see page 4, line 12 - line 21; figures	1-17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/EP 94/02554

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-9113689	19-09-91	DE-A- 4008068 AU-A- 7463391 EP-A- 0521022 JP-T- 5505142	19-09-91 10-10-91 07-01-93 05-08-93
US-A-4112945	12-09-78	US-A- 4091812	30-05-78
FR-A-711644		NONE	
DE-A-4134911	29-04-93	NONE	
FR-A-2625981	21-07-89	NONE	